

HVAC Provisions

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HVAC Section

● 3 paths to compliance ...

- Simplified approach
- Mandatory plus prescriptive
- Mandatory plus ECB



There's more ...

Simplified Approach

- Limited Scope
- Same requirements
- Fits on two pages



Simplified Approach (Cont'd)

● Limited to ...

- Buildings with 1 or 2 stories
- Buildings less than 25,000 ft²
- Single-zone system
- Air-cooled or evaporatively cooled only

Simplified Approach (Cont'd)

● Requirements

- Economizer as necessary
- Heat pump, fuel-fired furnace, electric resistance, or baseboard/boiler for heat
- OA < 3000 cfm and 70%
- Manual changeover or dual set-point thermostat

Simplified Approach (Cont'd)

- Supplemental heat controls on heat pumps
- No reheat for humidity controls
- Night setback controls
- Piping and ductwork insulated

Simplified Approach (Cont'd)

- Balancing within 10% of design airflow rates
- Interlocked thermostats if heating and cooling equipment are separate
- Exhaust > 300 cfm, gravity or motorize dampers
- System > 10,000 cfm, optimum start controls

Mandatory Requirements

- Requirements address ...
 - Equipment efficiencies
 - Controls
 - Construction and insulation
 - Drawings, manuals, and commissioning
- Required in both prescriptive and ECB compliance paths

Mandatory Equipment Covered

- Packaged air conditioners
- Heat pumps
- Chillers
- Packaged terminal/
room air conditioners
- Furnaces
- Boilers
- Heat rejection equipment



Mandatory Equipment Examples

<u>Equipment</u>	<u>Present</u>	<u>10/29/2001</u>
15-ton rooftop	8.5 EER	9.7 EER
300-ton WC	5.20 COP	6.10 COP
centrifugal	5.30 IPLV	6.10 IPLV

Mandatory Equipment Covered for the First Time

- Ground-source heat pumps
- Single- and double-effect absorption chillers
- Heat rejection equipment
- New categories for
 - Hot water and Steam boilers
 - Replacement PTAC's, PTHP's

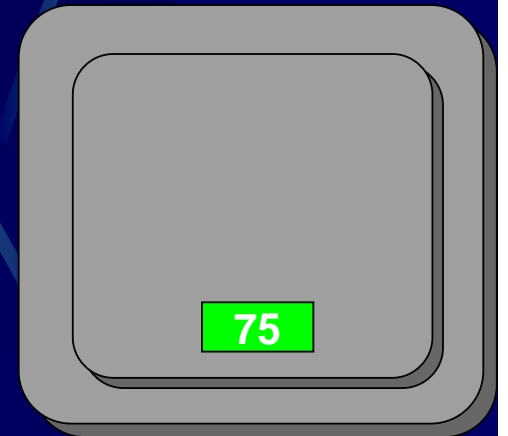


Mandatory Load Calculations

- Only requires calculations to be done
- No longer a sizing restriction

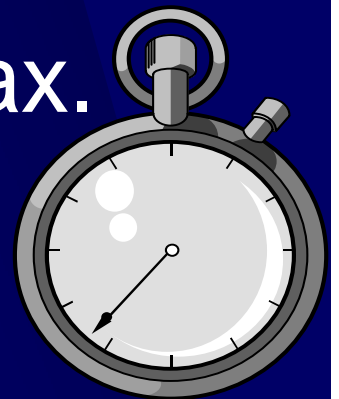
Mandatory Thermostatic Controls

- Required for each zone – perimeter can be treated differently
- 5° F deadband
 - Dual setpoint or deadband (can be software for DDC)



Mandatory Off-Hour Controls > 65,000 Btuh and $\frac{3}{4}$ hp

- Automatic shutdown via
 - Automatic time clock w/10 hour battery back up, or
 - Occupancy sensor, or
 - Manually-operated timer w/max. 2 hr duration, or
 - Interlock to security system



Mandatory
Off-Hour Controls
> 65,000 Btuh and $\frac{3}{4}$ hp
(Cont'd)

- Setback, except radiant floor or ceiling
- Optimum start if > 10,000 cfm

Mandatory Off-Hour Controls (Cont'd)

- Shut-off dampers controls
- Zone isolation
 - Isolation area maximum 25,000 ft² zone size on one floor
 - Ability to shut off airflow to isolation area
 - Central systems capable of stable operation for smallest isolation area

Mandatory Heat Pump Auxiliary Heat Control

- Heat pump with internal electric heaters need to use heat pump alone when load can be met
- Exception for NAECA products

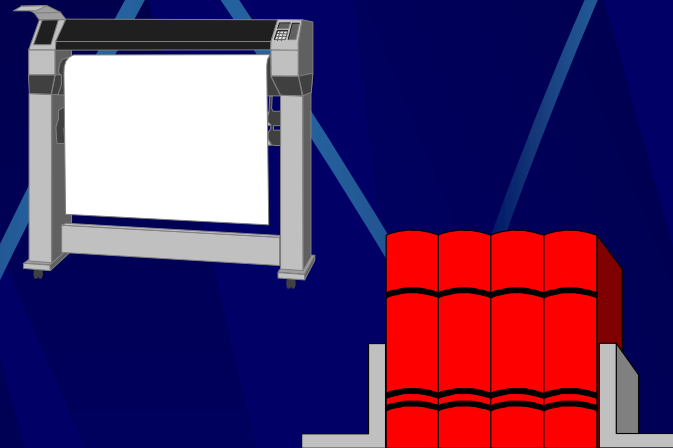
Mandatory Construction & Insulation

- Leakage tests (>3 in. w.c.)
- Piping insulation
- Duct insulation



Mandatory Completion Requirements

- Drawings
- Manuals
 - Operating
 - Maintenance



Mandatory Completion Requirements (Cont'd)

● Balancing

- Written report conditioned spaces $> 5000 \text{ ft}^2$
- Measured and adjusted within 10% of design
- Airside $> 1 \text{ hp}$ – except calibrated VAV
- Hydronic pumps $> 10 \text{ hp}$

Mandatory Completion Requirements (Cont'd)

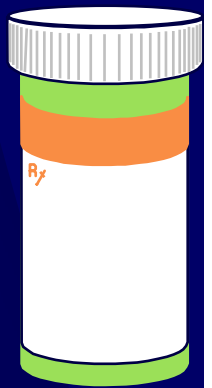
● Commissioning

- Control elements calibrated, adjusted and in working order
- > 50,000 ft² requires commissioning plan (Appendix E)

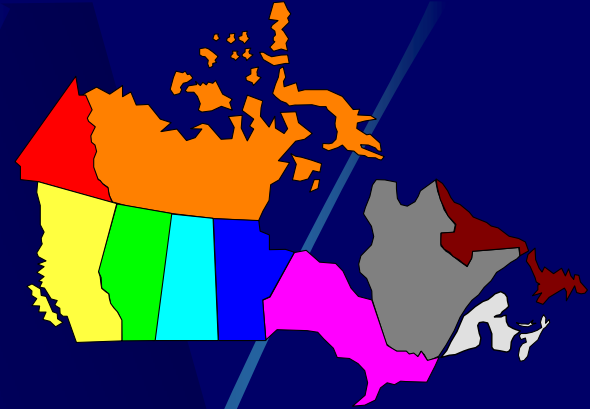
Prescriptive

● Requirements address ...

- Economizers
- Simultaneous heating and cooling
- Air system design and control
- Hydronic system design and control
- Heat rejection equipment control and limitations
- Heat recovery
- Exhaust hoods



Prescriptive Economizers



- Climate and size dependent
- Numerous exceptions
 - Including efficiency trade-off
- Integrated control
- High limit controls are climate dependent
- No increase in heating

Prescriptive Economizers (Cont'd)

- Waterside economizers allowed w/
 - Performance requirement
 - Limited pressure drop effect

Prescriptive Simultaneous Heating and Cooling Limitation

- Limits recooling, reheating or mixing of air
 - 0.4 cfm/sf or 300 cfm/zone or min ventilation
- Hydronic systems
 - Three pipe not allowed
 - Two pipe changeover control
 - Water loop heat pump systems controls



Dehumidification

- Humidistatic controls shall prevent
 - Reheating
 - Mixing of hot and cold air streams
 - Heating and cooling of same air stream



Dehumidification Exceptions

- Systems capable of reducing supply air flow to 50%, or to min. ventilation
- Systems under 6.67 tons that can unload at least 50%
- Systems smaller than 3.3 tons
- Process applications
- 75% of reheat or recool energy is recovered or solar

Prescriptive Air System Design and Control

- Fan system power limitation
 - Applies to systems > 5 hp
 - Limits based on nameplate hp of fans
 - Cold air, relief fan and some pressure credits available

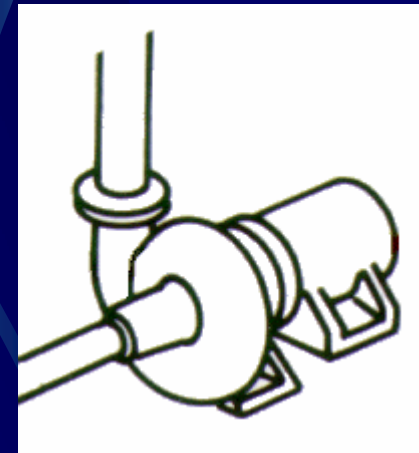


Prescriptive Air System Design and Control (Cont'd)

- VAV fan control for motors
30 hp
 - Provide for 30% design wattage at 50% air volume
 - DDC: Fan Pressure Optimization

Prescriptive Hydronic System Design and Control

- Variable flow required for systems
 - > 75 total hp
 - More than 3 control valves
- Performance req. for pumps > 100 ft head, > 50 hp
 - 30% design wattage at 50% flow



Prescriptive Hydronic System Design and Control (Cont'd)

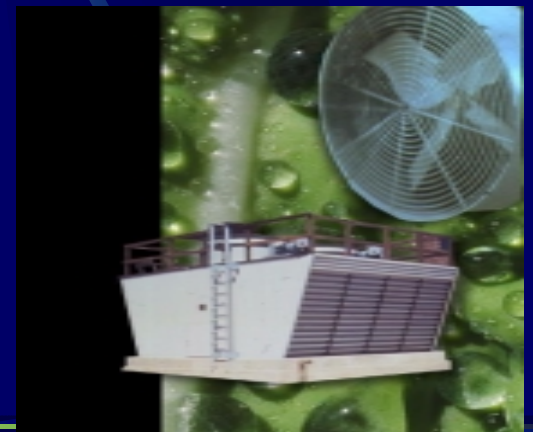
- Pump isolation for chillers or boilers piped in parallel
 - provide for flow reduction when one of multiple chiller or boilers is shut down

Prescriptive Hydronic System Design and Control (Cont'd)

- Chilled and hot water reset for $> 300,000$ Btu/h, exceptions:
 - Result in improper operation
 - Variable flow systems

Prescriptive Heat Rejection Equipment

- Fan speed control for motors 7.5 hp and up



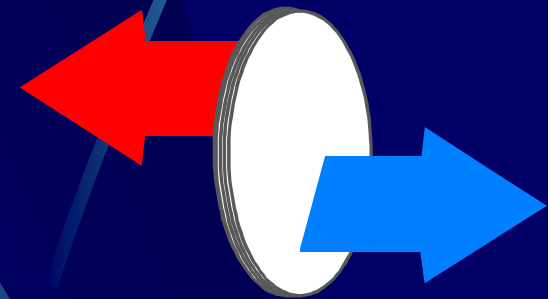
Prescriptive Heat Rejection Equipment (Cont'd)

● Exceptions

- Condenser fans on multiple circuits
- Condenser fans on flooded condensers
- Very warm climates
- 1/3 of the fans on a multiple fan application speed controlled

Prescriptive Energy Recovery

- Airside
 - 70% OA and 5000 cfm total
 - 50% effectiveness
- Condenser recovery for service water heating if
 - 24 hrs per day **and**
 - Heat rejection > 6 MMBtuh **and**
 - SWH load 1 MMBtuh

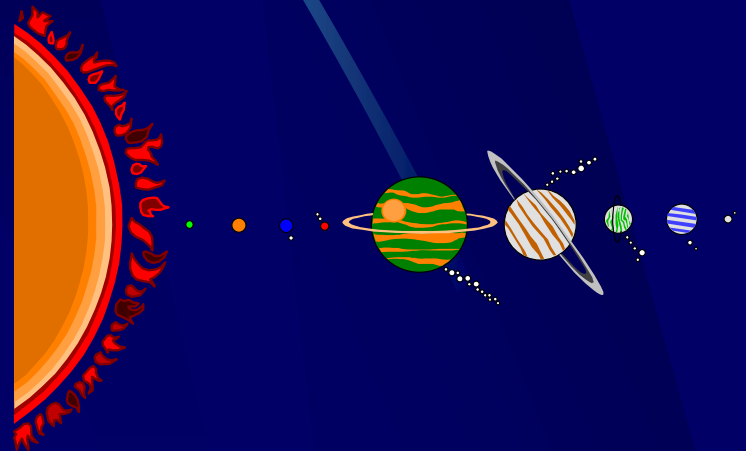


Prescriptive Exhaust Hoods

- Kitchen hoods makeup air req. if $> 5,000$ cfm
- Fume hood systems $> 15,000$ cfm
 - Operation to $< 50\%$ design flow or ...
 - Direct make-up at least 75% of exhaust rate at specified conditions or ...
 - Heat recovery for make-up air

Prescriptive Radiant Heating

- Req. for unenclosed spaces except loading dock w/ air curtain



Prescriptive Hot Gas Bypass Limitation

- > 7.5 tons
- Multiple steps or continuous unloading

Rated Capacity

Max. Hot Gas
Bypass Capacity
(% of Total Capacity)

$\leq 240,000$ Btu/h (70 kW)

50%

$> 240,000$ Btu/h (70 kW)

25%

Service Water Heating

- Equipment Efficiency
- Insulation
- Service water heating system controls

Service Water Heating (Cont'd)

- Pool heaters and covers
- Prescriptive for
 - Space and water heating
 - Service water heating